

JOURNALS PUBLISHED BY US



Publishing - Distribution - Hosting by

CONNECT JOURNALS

D-189, Ramprastha Colony,
PO Chander Nagar
Ghaziabad - 201011,
INDIA

E : contact@connectjournals.com
W: www.connectjournals.com

BIOPESTICIDES INTERNATIONAL

• VOL. 18 NO. 2

• JULY - DECEMBER 2022

• 89 - 193



BIOPESTICIDES INTERNATIONAL

ISSN 0973-483X
e-ISSN 0976-9412

Vol. 18

JULY - DECEMBER 2022

No. 02

Editor-in-Chief
DR. OPENDER KOUL

Included in Group A of UGC-CARE List
NAAS rating 2022 : 4.76
Indexed in: Web-Of-Science (Clarivate Analytics)

Journal Homepage : www.connectjournals.com/bi

Publishing and Hosting by
CONNECT Journals®
www.connectjournals.com

BIOPESTICIDES INTERNATIONAL

A Bi-Annual International Journal

EDITOR-IN-CHIEF

OPENDER KOUL

Insect Biopesticide Research Centre

30 Parkash Nagar, Model town

Jalandhar, 144003, India and

Adjunct Professor, Kasetsart
University, Bangkok, Thailand

Email: okoul@koulresearch.org;

okoul@yahoo.com

REGIONAL EDITORS

John D. Stark

Puyallup Research and Extension Center

Washington State University

2606 W. Pioneer, Puyallup,
Washington-98371, USA

Email: starkj@wsu.edu

Juan A. Morales-Ramos

National Biological Control Laboratory

USDA, ARS, 59 Lee Road,
Stoneville, MS-38776, USA

Email: Juan.MoralesRamos@ARS.USDA.GOV

M. B. Isman

Faculty of Land and Food Systems

University of British Columbia

Vancouver, BC, Canada, V6T 1Z4

Email: murray.isman@ubc.ca

Tong-Xian Liu

Northwest A & F University

Yangling, Shaanxi, 712100, China

Email: Tongxianliu@yahoo.com;
txliu@nwsuaf.edu.cn

Philip C. Stevenson

Natural Resource Institute

University of Greenwich, Kent,

ME4 4TB, UK and

Royal Botanical Gardens,

Kew. TW9 3AB, UK

Email: p.c.stevenson@gre.ac.uk

EDITORIAL ADVISORY BOARD

Steven Belmain

Professor of Ecology at Natural Resources Institute,
University of Greenwich
Chatham, Kent, UK
E-Mail: S.R.Belmain@gre.ac.uk

Alistair Bishop

University of Plymouth, School of Biological Sciences
Plymouth, Plymouth, GB
E-Mail: alistair.bishop@plymouth.ac.uk

Carlos L. Cespedes

Professor Titular
Plant Biochemistry and Phytochemical Ecology Lab
Basic Sciences Department, University of Bio Bio, Chile
E-mail: cespedes.leonardo@gmail.com

Kamal Chauhan

USDA-ARS Chemicals Affecting Insect Behavior Laboratory,
10300 Baltimore Avenue
Beltsville, MD
E-Mail: kamal.chauhan@ars.usda.gov

Mukund Deshpande

Greenvention Biotech Pvt. Ltd., Pune, India
E-Mail: mvdeshpande1952@gmail.com

Sunita Facknath,

Faculty of Agriculture, University of Mauritius
Reduit, Mauratius
E-Mail: suniff@uom.ac.mu

Qili Feng

Guangzhou Key Lab of Insect Development,
Regulation and Application Research
South China Normal University, Guangzhou, China
E-Mail: qlfeng@scnu.edu.cn

Christopher J. Geden

Research Entomologist, USDA, ARS, Gainesville, USA
E-Mail: chris.geden@usda.gov

G. T. Gujar

Ex-Head, Division of Entomology
Indian Agricultural Research Institute, New Delhi, India
E-mail: gtgujar@yahoo.com

Dwayne D. Hegedus

Saskatoon Research and Development Center
107 Science Place, Saskatoon, Saskatchewan S7N 0X2,
Canada
E-Mail: dwayne.hegedus@agr.gc.ca

Angelika Hilbeck

Department of Environmental Systems Sciences
Institut für Integrative Biologie,
Universitätsstrasse 16 8092 Zürich, Switzerland
E-Mail: angelika.hilbeck@env.ethz.ch

Hans E. Hummel

Justus Liebig Universität Gießen,
Faculty of Agricultural Sciences
Nutritional Sciences and Environment Management
Giessen, Hesse, Germany
E-mail: hans.e.hummel@agr.uni-giessen.de

William D. Hutchison

Professor of Entomology, Department of Entomology,
University of Minnesota
219 Hodson Hall, 1980 Folwell Ave, Falcon Heights, St. Paul,
MN, 55108, USA
E-Mail: bill.hutchison@uhnresearch.ca

Jorge E. Ibarra

Center for research and Advanced Studies,
National Polytechnic Institute
Departamento: Biotecnología y Biotecnología,
Laboratorio de Bioinsecticidas, Cinvestav, Mexico
E-mail: jorge.ibarra@cinvestav.mx

B. L. Jalali

Ex-Research Director, CCS Haryana Agricultural University
Hissar, India.
E-Mail: bljalali@gmail.com

Harry K. Kaya

Professor Emeritus, Department of Entomology and Nematology
University of California Davis, Davis, CA 95616, USA
E-Mail: hkkaya@ucdavis.edu

G. G. Khachatourians

Department of Food and Bioproduct Sciences
University of Saskatchewan, Saskatoon, Canada
E-Mail: george.khachatourians@usask.ca

Hoi-Seon Lee

Department of Bioenvironmental Chemistry
Chonbuk National University, Jeonju 561-756, South Korea
E-Mail: hhoiseon@jnu.ac.kr

Vijay L. Maheshwari

Professor, School of Life Sciences, Department of Biochemistry
KBC North Maharashtra Unbiversity
Jalgaon 425001, India
E-Mail: vjmaheshwari@rediffmail.com

Sameh A. Mansour

Environmental Toxicology Research Unit (ETRU),
Department of Pesticide Chemistry
National Research Centre, Dokki, Cairo, Egypt
E-Mail: Sameh.Mansour@mansomar.com

Daniela M. A. F. Navarro

Departamento de Química Fundamental,
Universidade Federal de Pernambuco (UFPE)
Cidade Universitária, 50740-560, Recife, PE, Brazil
E-Mail: dmafn@ufpe.br

J. Nawrot

Ex-Head, Department of Entomology,
Institute of Plant protection, Poznan, Poland
E-Mail: jw.nawrot@gmail.com

Maureen O'Callaghan

AgResearch, Private Bag 4749,
Christchurch 8140, New Zealand
E-Mail: Maureen.o'callaghan@agresearch.co.nz

Sara Maria Palacios

Fine Chemical and Natural Products Laboratory,
School of Chemistry
Catholic University of Córdoba
Av. Armada Argentina 3555, Córdoba,
Argentina
E-Mail: sarapalacios@ucc.edu.ar

Roman Pavella

Crop Research Institute, Dmrovska 507, 161 06 Prague
Czech Republic
E-Mail: pavela@vurv.cz

Appa Rao Podile

Vice Chancellor and Professor of Life sciences
University of Hyderabad
Hyderabad Central University Rd, CUC, Gachibowli,
Telangana 500046, India
E-mail: podilerao@gmail.com; podilerao@uoahyd.ac.in

Guadalupe Rojas

Biological Control of Pest Research, USDA, ARS
59 Lee Road , NBCL, Stoneville, MS 387760067, USA
E-Mail: guadalupe.rojas@usda.gov

S. Senthil-Nathan

Sri Paramakalyani Centre for Excellence in Environmental Sciences,
Manonmaniam Sundaranar University
Alwarkurichi 627 412, Tamil- Nadu, India
E-Mail: senthil@msuniv.ac.in

David Shapiro-Ilan

Fruit and Tree Nut Research, USDA, ARS
21 Dunbar Road, Byron, GA 310080000, USA
E-Mail: david.shapiro@usda.gov

Ram Singh

Ex-Head, Department of Entomology
CCS Agricultural University, Hissar, India
E-Mail: ramjood@rediffmail.com

C. M. Smith

University Distinguished Professor Emeritus
University of Kansas, 128 W. Waters Hall
Manhattan KS 66506, USA
E-Mail: cmsmith@ksu.edu

Duraïd K. Al Taey

Department of Horticulture, College of agriculture
Al-Qasim Green University, Iraq
E-Mail: duraidaltaey@gmail.com

Suresh Walla

Consultant, AINP on Pesticide Residues
Division of Agricultural Chemicals, IARI
New Delhi 110012, India
E-Mail: suresh_walla@yahoo.com

S. P. Wraight

Research Ecologist, USDA-ARS,
Emerging Pest and Pathogen Research
Biological Integrated Pest Management Unit, Ithaca, NY, USA
E-Mail: steve.wraight@ars.usda.gov

Hanhong Xu

State Key Laboratory for Conservation and Utilization of
Subtropical Agro-Bioresources
and Key Laboratory of Natural Pesticide and Chemical Biology
Ministry of Education, South China Agricultural University,
Guangzhou, China
E-Mail: hixu@scau.edu.cn

Biopesticides International

Biopesticides International was established in 2005 and is covering the field of biopesticides and various allied aspects, pure and applied, related to this field. The scope of the journal is broad in the sense that it publishes the latest developments in biopesticide research based on natural sources like plants, microbes, fungi, predators and parasitoids and allied materials like bio-herbicides and entomopathogenic nematodes including diverse studies of entomological, toxicological, agricultural, biochemical, molecular and biotechnological nature related to biological pesticides. The journal also seeks to promote insect plant interaction studies and manipulation of plant genomes for in vivo production of pesticides that is gaining importance. The journal also has a mandate to include the titles related to governance of biopesticides and to publish papers that could cover issues that are in the realm of socio-political sciences, law and legal instruments, ethics, environmental impacts related to biopesticides, etc. The journal publishes articles under 3 categories.

- Review Articles (normally by invitation only but welcome suggestions for timely topics and potential authors for reviews are acceptable).
- Research Papers (should normally occupy six to ten printed pages; approximately 4000-7000 words).
- General articles (based on potential agricultural importance vis-à-vis the problems in agriculture sciences and biopesticide-based data. The general aspects of governance, issues in socio-political, law and legal instruments, ethics, environmental impacts from agricultural perspective will also be considered.

The journal is supported by eminent Regional Editors, Editorial Board Members and Expert Reviewers globally. The support of all Reviewers is duly acknowledged in the last issue of each volume.

THE JOURNAL IS PUBLISHED IN PRINT AS WELL AS ONLINE VERSIONS.

SUBMISSION OF MANUSCRIPTS

Manuscripts should be submitted online at www.PublishAtCJ.com where further information on the process of submission and registration is available. All Correspondence and Status relating to the submission is available online on this system. In case of any problem relating to submission, you may write at info@PublishAtCJ.com. All the review process will be handled at the online platform; however, the final acceptance of the article will be at the sole discretion of the Chief Editor.

Plagiarism: The papers are required to be plagiarism checked as per international requirements

Papers should be typed double-spaced with 1-inch-wide margins on all sides with full title, abstract, abbreviated title for running headlines (up to 35 characters), 4 to 6 keywords, references and figures. Except for reviews, each paper should be presented in the order of Abstract, Keywords, Introduction, Materials and Methods, Results, Discussion, Acknowledgements, References, Tables and Figure captions. References in the text should follow the Harvard style. Exact style can be seen as a sample paper available at www.PublishAtCJ.com and also at www.connectjournals.com/bi.

The title page should include, in addition to the title, the initials and surnames of each author followed by his or her department, institution and address including postal code and country and email address. Please indicate the author for correspondence, whose telephone, fax and E-mail numbers should be included. The present address of authors should appear as a footnote if different. The title page should also indicate the number of manuscript pages, figures and tables.

Keywords: Four to six keywords should be listed in alphabetical order at the bottom of the title page.

Abstract: This should be no more than 200 words in length, should summarize the significant findings and inferences only.

Text Headings: Text headings should be typed as **FIRST-LEVEL HEADING**, **Second-Level Heading**, **Third-level heading**.

References: References should follow the pattern given below

Journal articles:

Champagne, D.E., Koul, O., Isman, M.B., Towers G.H.N. and Scudder, G.G.E. (1992) Biological activity of limonoids from therutales. *Photochemistry*,**31**,311-394.

Chapter in Book:

Simmonds, M.S.J. and Blaney, W.M. (1992) Labiatae-insect interactions: Effect of Labiatae-derived compounds on insect behaviour.

In R.M. Harley and T. Reynolds (eds.), Advances in Labiatae Science, Royal Botanic Gardens, Kew, pp. 375-392.

Book:

Koul, O. (2016) *Naturally Occurring Insecticidal Toxins*, CAB International, Wallingford, UK.

Figures: All figures should be numbered with consecutive Arabic numbers, have descriptive legends, and be mentioned in the text. Keep figures separate from the text, but indicate an approximate position for each figure in the margin. The quality of line drawings and photographs must be of high enough standard for direct reproduction. Photographs intended for halftone reproductions must be good glossy original prints of maximum contrast. A list of figure legends with relevant figure numbers be typed on a separate sheet and included with the typescript. Colored figures will be charged as per the journal policy from the authors and information regarding this can be obtained from info@PublishAtCJ.com.

Tables: Tables should be consecutively numbered with Arabic numbers and have a clear descriptive title at the top. Explanatory table footnotes (designated by superscript lower-case letters) typed below the table are acceptable.

Abbreviations and Conventions: Use of abbreviations should be as per the Systeme Internationale Symbols.

PROOFS: The page proofs to authors will be provided through online platform at <http://publishatcj.com>.

COPYRIGHT: Submission of a paper will be taken to imply that it represents original work not previously published that is not being considered elsewhere for publication and that if accepted for publication, it will not be published elsewhere in the same form, in any language, without the consent of the publisher. It is a condition of acceptance by the editor-in-chief of a typescript for publication that the publishers automatically acquire the copyright of the manuscript. The statements, inaccurate data, opinions and views expressed by the authors in articles are of their own and not of the journal. The editors or publishers of the journal will not be responsible for the authenticity of data and results drawn by authors.

REPRINTS: The corresponding author will receive an electronic reprint of their paper for non-commercial use. Printed reprints may be purchased.

PAPER PROCESSING AND ISSUE CHARGES: After acceptance of the paper, it is mandatory for authors to purchase the print issue wherein the paper is published. An amount of USD-300 per paper has been fixed for overseas authors.

To promote the journal, authors must recommend the journal in their institutional library; for greater access and benefit to other researchers, and also to increase citation of the article in the journal.

Subscription details are available at www.connectjournals.com/bi.